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Ginning ACALA COTTONS *in the Southwest*

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CONTENTS

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Ginning **ACALA COTTONS** *in the Southwest*

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Regional differences, such as weather, soil fertility, varieties of cotton, and cultural and harvesting practices, greatly influence the physical properties of cotton brought to gins. Consequently, cottons grown under irrigation in the Southwest differ in ginning and fiber characteristics from those grown in humid regions of the Cotton Belt.

The United States Southwestern Cotton Ginning Research Laboratory, Mesilla Park, N. Mex. (fig. 1), was established to work on problems peculiar to the Southwest. One of the first research projects initiated at this laboratory was a study conducted to determine the combinations of equipment required to obtain best results in handling, drying, cleaning, extracting, ginning, and pressing cottons grown in the region.

Ginning tests were conducted at this laboratory (1949–57) on all the predominant varieties of cotton grown in Arizona, New Mexico, and District 6 of Texas (see figure 2). The California variety used in these tests was produced near Blythe, which is on the Arizona-California State line; therefore it was not typical of the cottons grown in other parts of the State where cottons usually contain more moisture under higher relative humidity. Extensive data were obtained from basic engineering and technological research conducted during this series of tests. This

[1] The earlier research studies reported in this publication were conducted in cooperation with the former Cotton Branch, Production and Marketing Administration, United States Department of Agriculture.

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Figure 1.—Southwestern Cotton Ginning Research Laboratory, Mesilla Park, N. Mex.

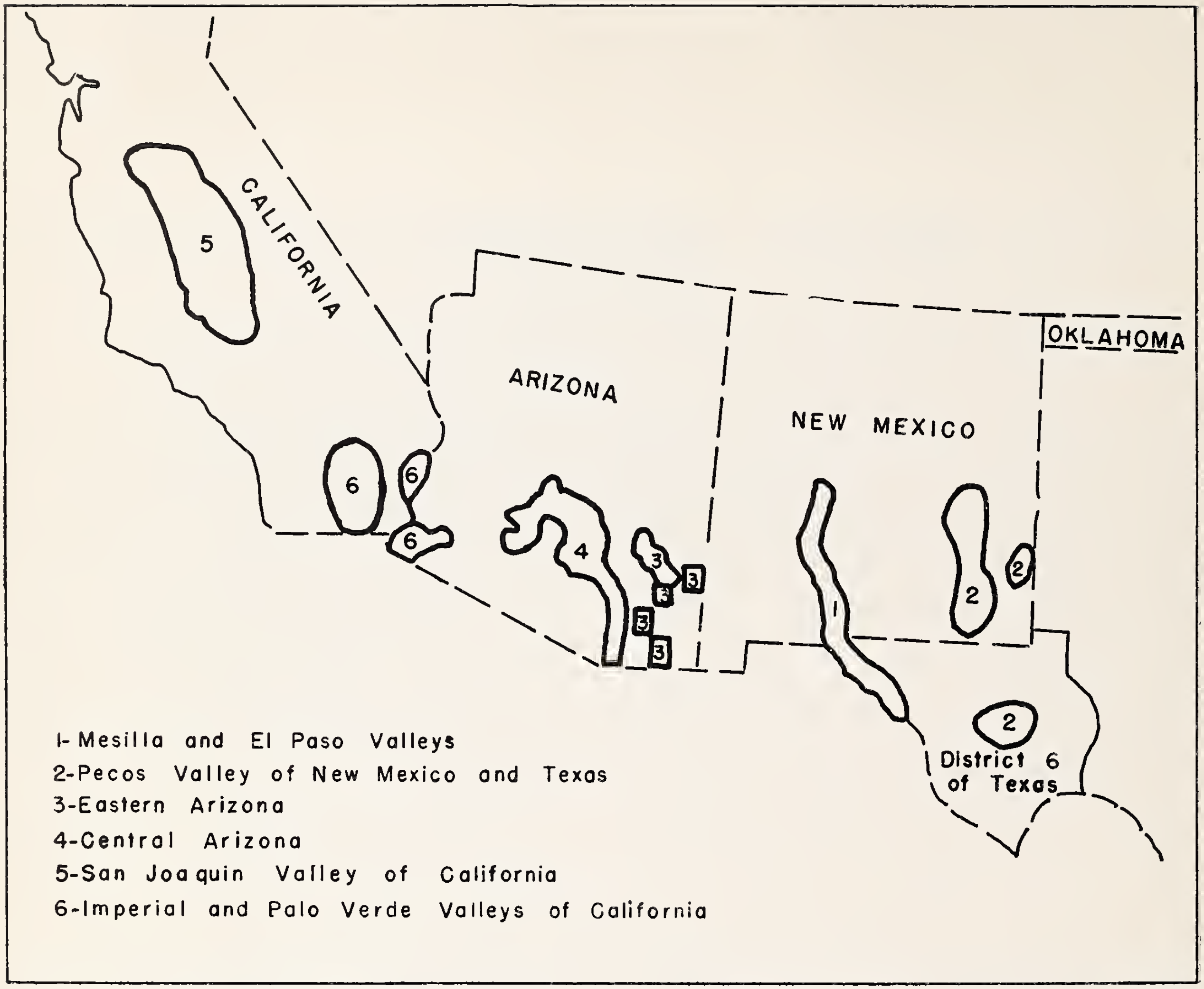

Figure 2.—Southwestern irrigated cotton-producing areas.

publication is based on the most significant parts of these data, and its purpose is to make this information available to cotton growers and ginners.

The mention in this publication of commercially manufactured equipment does not imply its endorsement by the United States Department of Agriculture over similar products not named.

Scope and Nature of the Studies

The term Southwest, as used in this publication, refers to the irrigated cotton-producing sections of California, Arizona, New Mexico, and District 6 of Texas (fig. 2). Cotton production has increased in the Southwest from about 105,000 bales in 1920 to about 2,800,000 bales in 1957, as shown in figure 3.

Practically all upland cottons grown in the Southwest are derived from the original Acala cotton that was introduced into this country from Mexico in 1906. The varieties grown in New Mexico and in District 6 of Texas, and that were used in the ginning-research tests, included Acala 1517 (B and C strains), 1517BR (blight-resistant strain), and Mesilla Valley. Acala 44, also known as Arizona 44—the main upland variety grown in Arizona—was used in the seed-cotton-cleaning tests. Acala 4–42, which is grown in California, was also included in the tests. These varieties differ in such fiber characteristics as staple length, strength, and fineness.

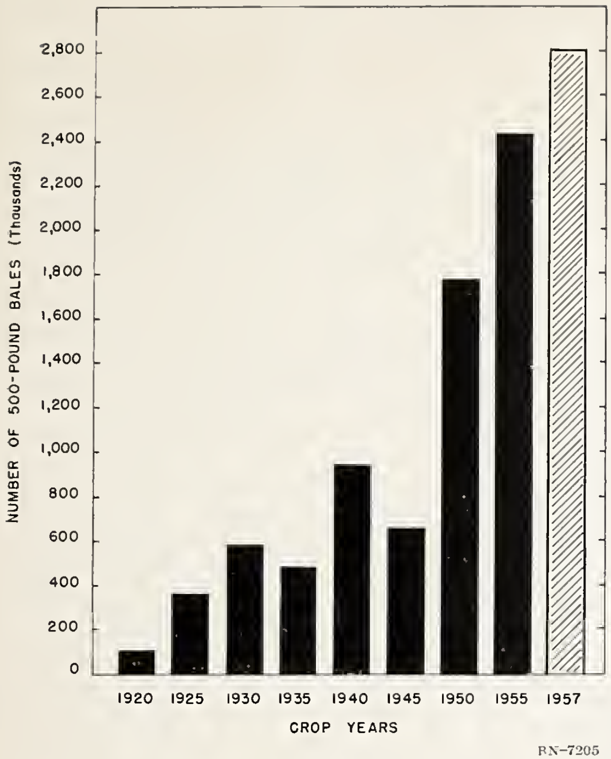

FIGURE 3.—Number of 500-pound bales of cotton produced in Arizona, New Mexico, California, and District 6 of Texas at 5-year intervals for crop years 1920–55 and for crop year 1957. (Data for 1920–55 are from Agr. Statis. and Cotton Quality Rpt., Western Area, Vol. 29, No. 10a, 1956, issued by U. S. Agr. Market. Serv., Cotton Div., Phoenix, Ariz. Data for 1957 are from estimates supplied by Crop Rptg. Bd., U. S. Agr. Market. Serv. All data are based on U. S. Bureau of the Census figures.)

All cottons for these tests were so selected as to be representative of the most commonly grown varieties in each area, and also representative of accepted or promising cultural and harvesting methods. All cottons were irrigated with either impounded irrigation-project ditch water or with well water.

Overhead Machinery Used in Cleaning Tests

Tests on Undefoliated Cottons (Crops of 1949–52)

During the earlier years of the operation of the Southwestern Cotton Ginning Research Laboratory (1950–52), seed-cotton cleaning tests, without defoliation, were run on four varieties of cotton—Acala 1517, Mesilla Valley, Acala (Arizona) 44, and Acala 4–42. The varieties, seasons of harvest, methods of harvest, and ginning equipment tested in the research program are shown in figure 4. All cottons were subjected to six alternate cleaning and extracting setups. These included 3 combinations of 6-, 13-, and 19-cylinder screen cleaners, each of these combinations having a distributor and an extractor-feeder but no bur machine; and 3 of the same combinations plus a bur machine. All cottons were ginned in a conventional 80-saw air-blast gin. Each type of cotton was tested in three replications.

A ginning-performance analysis for each ginning setup, based on engineering tests conducted (1950–52) on crops of 1949–52 to determine ginning capacity and lint turnout for all the types of cottons tested, is given in table 1.

Samples of seed cotton and lint were drawn at the time of ginning for cotton-quality analyses in relation to ginning. Seed-cotton samples were drawn from the wagon and at the feeder for foreign-matter and moisture-content determinations. Lint samples were drawn for moisture and various fiber analyses, for classification, and for spinning tests. In addition to the ginning characteristics of capacity and turnout, table 1 shows the qualitative characteristics of the ginned lint.

The turnout (percentage of lint), a varietal characteristic, underwent no marked changes from effects of the various cleaning setups used in these tests. When all types and varieties of cotton were considered together, their respective average turnouts were found to be practically constant for all ginning combinations.

The lint moisture contents of all the southwestern cottons were characteristically low, ranging from 4 to 6 percent of moisture. This low moisture percentage provided desirable conditions for cleaning the cotton at the gin. Generally, the machine-picked cottons contained more moisture than did the hand-picked wagon samples of seed cotton. The application of moderate heat (160° F.) in the tower drier tended to reduce the lint moisture contents of the machine-picked cottons to the same level as those of the hand-picked cottons. None of the hand-picked cottons tested were dried at the laboratory prior to ginning.

The percentages of foreign matter in the wagon samples ranged from a low of 1.3 percent for midseason hand-picked Mesilla Valley cotton

ACALA COTTONS USED IN CLEANING TESTS

STATES	NEW MEXICO								ARIZONA				CALIFORNIA			
VARIETIES	1517				MESILLA VALLEY				A-44				4-42			
SEASON OF HARVEST	MID		LATE		MID		LATE		MID		LATE		MID		LATE	
METHOD OF HARVEST	HP		HP		HP		HP		HP	MP	HP	MP	HP	MP		MP

HP = hand-picked, MP = machine-picked

GINNING SETUPS

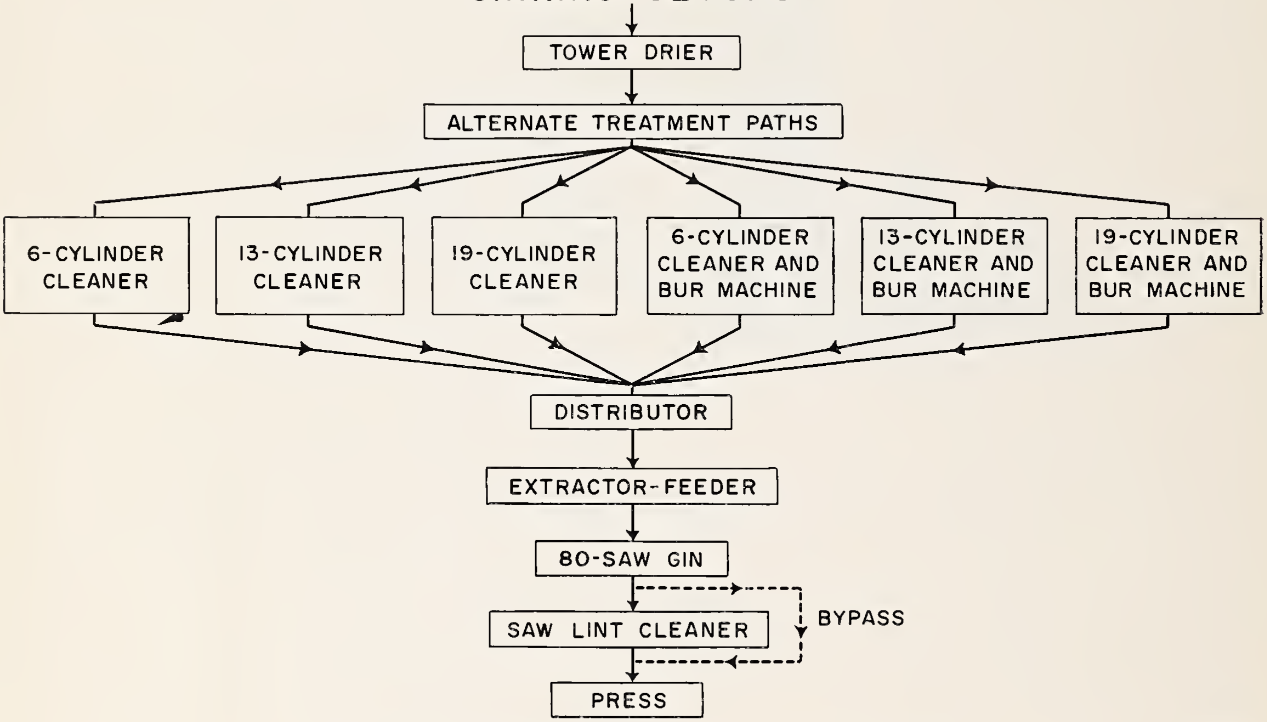

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FIGURE 4.—Ginning setups employed in tests of 1950–52.

to a high of 10.8 percent for late-season machine-picked Acala 4–42. None of the cottons were harvested in the manner commonly known as "rough-harvesting," a term applied to stripping, pulling bollies, and so on; they were harvested by methods regarded as conventional in the Southwest where these varieties are grown. Most of the Acala 1517 and Mesilla Valley growths are customarily handpicked; the Arizona 44 and Acala 4–42 varieties, in Arizona and California, respectively, are both hand and machine picked.

None of the varieties tested in this study appeared to suffer fiber damage from the ginning treatments. However, the maximum test cleaning treaments proved to be excessive for most of the cottons that were already dry and reasonably clean; and they did not further improve grades of cotton that had already been subjected to setups with less equipment. Unnecessary cleaning usually causes loss to the producer in both weight and bale value.

The midseason clean hand-picked Mesilla Valley variety attained its top grade of Strict Middling in the control lot for which only six cylinders of cleaning plus extractor-feeders were used, and it could not be further improved by adding preginning cleaning cylinders or bur machines. Both hand- and machine-picked late-season trashier cottons required up to 19 cleaning cylinders, or 13 cleaning cylinders plus the bur-machine extracting, in order to obtain the highest grades in these tests. These cottons were thereby improved from one-third grade to one full grade in the lower grade ranges, resulting in more profit for the producer.

Seed-cotton cleaning and extracting combinations required to obtain the highest grades in these tests for different seasons and methods of harvest are given in table 2. The ranges of foreign-matter percentages and moisture percentages in the wagon samples for each type of cotton are shown; also, the maximum grades obtained, and the grade improvements over the control setup that had only six cylinders of cleaning plus the extractor-feeder.

TABLE 1.—*Effects of preliminary seed-cotton treatments on the ginning performance, fiber properties, and spinning performance of varieties of Acala cottons* [1]

MIDSEASON UNDEFOLIATED HAND-PICKED ACALA 1517 (crops of 1949-52) [2]

Test item	Values obtained by preginning treatments with—					
	6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	19-cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour___pounds__	6. 4	6. 6	6. 6	7. 2	7. 0	6. 8
Turnout___percent__	37. 0	36. 2	36. 0	36. 8	36. 6	36. 6
Fiber:						
Lint moisture___do___	4. 6	4. 6	4. 6	4. 7	4. 5	4. 7
Grade [3]___designation__	M+	SM−	SM−	SM−	SM−	SM−
Staple length___1/32 inch__	36	36	36	35	36	36
Upper half mean length (Fibrograph) inches__	1. 15	1. 15	1. 14	1. 14	1. 14	1. 14
Uniformity ratio___index__	77	77	77	77	77	77
Strength___1,000 pounds per square inch__	86	86	86	86	86	86
Nonlint content___percent__	3. 2	3. 1	3. 2	3. 4	3. 3	3. 0
Spinning:						
Picker and card waste___do___	8. 2	7. 6	8. 0	8. 6	8. 0	8. 2
Neps number per 100 square inches of card web__	33	31	36	33	29	37
Average yarn strength___index__	104	104	104	104	108	105
Average yarn appearance___do___	98	101	101	100	102	96

LATE-SEASON UNDEFOLIATED HAND-PICKED ACALA 1517 (crops of 1950-52) [4]

Test item	6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	19-cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour___pounds__	5. 0	5. 4	5. 2	5. 6	5. 4	5. 2
Turnout___percent__	37. 5	38. 0	36. 8	36. 2	37. 0	36. 8
Fiber:						
Lint moisture___do___	4. 4	4. 4	4. 6	4. 5	4. 4	4. 4
Grade [3]___designation__	M+	SM−	SM	SM−	SM−	SM−
Staple length___1/32 inch__	36	36	36	36	36	36
Upper half mean length (Fibrograph) inches__	1. 10	1. 10	1. 11	1. 10	1. 10	1. 11
Uniformity ratio___index__	75	76	76	77	76	76
Strength___1,000 pounds per square inch__	87	87	87	87	86	88
Nonlint content___percent__	5. 0	4. 8	4. 3	4. 6	4. 5	4. 2
Spinning:						
Picker and card waste___do___	9. 5	9. 0	9. 0	9. 0	8. 9	9. 0
Neps number per 100 square inches of card web__	31	38	36	36	33	41
Average yarn strength___index__	110	109	110	110	110	110
Average yarn appearance___do___	93	88	90	93	90	90

See footnotes at end of table.

TABLE 1.—*Effects of preliminary seed-cotton treatments on the ginning performance, fiber properties, and spinning performance of varieties of Acala cottons* [1]—Continued

MIDSEASON UNDEFOLIATED HAND-PICKED MESILLA VALLEY (crops of 1950–52) [5]

Test item	Values obtained by preginning treatments with— 6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	19-cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour___pounds__	6. 1	6. 0	6. 2	6. 8	6. 4	6. 2
Turnout_______percent__	32. 5	34. 7	32. 8	33. 4	34. 1	34. 1
Fiber:						
Lint moisture_______do____	4. 3	4. 3	4. 4	4. 5	4. 3	4. 3
Grade [3]_______designation__	SM	SM	SM	SM	SM	SM
Staple length_______1/32 inch__	38	39	39	39	38	39
Upper half mean length (Fibrograph) inches__	1. 23	1. 24	1. 23	1. 23	1. 22	1. 22
Uniformity ratio_______index__	75	75	74	74	75	74
Strength____1,000 pounds per square inch__	92	92	91	92	91	91
Nonlint content_______percent__	3. 2	3. 1	3. 4	3. 2	3. 3	3. 1
Spinning:						
Picker and card waste_______do____	8. 2	7. 7	7. 9	8. 0	8. 3	8. 0
Neps number per 100 square inches of card web__	23	29	25	24	26	24
Average yarn strength_______index__	112	110	110	111	111	111
Average yarn appearance_______do____	104	102	102	104	104	102
LATE-SEASON UNDEFOLIATED HAND-PICKED MESILLA VALLEY (crops of 1950–52) [6]						
Ginning:						
Capacity, lint per saw per hour____pounds__	5. 4	5. 3	5. 2	5. 6	5. 6	5. 1
Turnout_______percent__	33. 4	33. 2	33. 5	33. 2	33. 0	33. 9
Fiber:						
Lint moisture_______do____	4. 9	4. 9	4. 9	5. 0	4. 9	4. 9
Grade [3]_______designation__	M	M+	SM−	M+	SM−	SM−
Staple length_______1/32 inch__	38	38	38	38	38	36
Upper half mean length (Fibrograph) inches__	1. 19	1. 18	1. 17	1. 18	1. 19	1. 18
Uniformity ratio_______index__	73	74	73	74	74	74
Strength____1,000 pounds per square inch__	92	92	93	93	92	93
Nonlint content_______percent__	4. 8	4. 6	4. 4	4. 7	4. 3	4. 4
Spinning:						
Picker and card waste_______do____	8. 9	8. 7	8. 5	9. 1	8. 3	8. 9
Neps number per 100 square inches of card web__	35	34	41	29	28	34
Average yarn strength_______index__	109	111	110	110	111	110
Average yarn appearance_______do____	98	98	100	98	98	98
MIDSEASON UNDEFOLIATED HAND-PICKED ARIZONA 44 (crops of 1950–51) [7]						
Ginning:						
Capacity, lint per saw per hour____pounds__	6. 0	5. 8	5. 7	6. 0	5. 9	5. 6
Turnout_______percent__	38. 8	38. 0	39. 0	38. 1	38. 2	37. 9
Fiber:						
Lint moisture_______do____	4. 1	4. 1	4. 1	4. 1	3. 9	4. 0
Grade [3]_______designation__	SM	SM+	SM+	SM+	SM+	SM+
Staple length_______1/32 inch__	34	34	34	34	34	34
Upper half mean length (Fibrograph) inches__	1. 10	1. 10	1. 09	1. 10	1. 09	1. 10
Uniformity ratio_______index__	79	79	78	79	79	79
Strength____1,000 pounds per square inch__	84	82	84	82	82	82
Nonlint content_______percent__	4. 2	3. 7	3. 6	3. 7	3. 6	4. 1
Spinning:						
Picker and card waste_______do____	8. 3	8. 4	8. 4	8. 3	7. 7	8. 0
Neps number per 100 square inches of card web__	35	36	36	27	24	32
Average yarn strength_______index__	98	97	96	96	96	94
Average yarn appearance_______do____	90	90	90	92	88	82

See footnotes at end of table.

TABLE 1.—*Effects of preliminary seed-cotton treatments on the ginning performance, fiber properties, and spinning performance of varieties of Acala cottons* [1]—Continued

LATE-SEASON UNDEFOLIATED HAND-PICKED ARIZONA 44 (crops of 1950–51) [8]

Test item	Values obtained by preginning treatments with—					
	6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	19-cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour ____ pounds __	6. 3	6. 2	6. 0	6. 9	6. 4	5. 8
Turnout ____ percent __	39. 8	38. 8	38. 5	38. 2	38. 6	38. 7
Fiber:						
Lint moisture ____ do ____	4. 6	4. 6	4. 4	4. 4	4. 4	4. 2
Grade [3] ____ designation __	M	SM	SM	SM	SM	SM—
Staple length ____ 1/32 inch __	34	34	34	34	34	34
Upper half mean length (Fibrograph) inches __	1. 07	1. 08	1. 08	1. 07	1. 08	1. 08
Uniformity ratio ____ index __	78	79	78	78	80	78
Strength ____ 1,000 pounds per square inch __	80	83	84	83	83	81
Nonlint content ____ percent __	3. 7	4. 0	3. 9	4. 0	3. 6	3. 7
Spinning:						
Picker and card waste ____ do ____	7. 7	8. 6	7. 6	8. 1	7. 7	7. 8
Neps number per 100 square inches of card web __	42	36	37	42	54	40
Average yarn strength ____ index __	98	97	98	96	95	97
Average yarn appearance ____ do ____	85	85	85	90	90	85

MIDSEASON UNDEFOLIATED MACHINE-PICKED ARIZONA 44 (crops of 1951–52) [9]

Test item	6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	19-cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour ____ pounds __	7. 4	7. 0	7. 6	7. 7	7. 1	7. 4
Turnout ____ percent __	37. 0	36. 8	38. 2	37. 1	36. 2	36. 5
Fiber:						
Lint moisture ____ do ____	4. 4	4. 3	4. 4	4. 3	4. 1	4. 0
Grade [3] ____ designation __	M—	M+	M	M—	M+	M+
Staple length ____ 1/32 inch __	35	35	34	34	34	35
Upper half mean length (Fibrograph) inches __	1. 05	1. 05	1. 06	1. 06	1. 05	1. 04
Uniformity ratio ____ index __	75	75	73	75	75	74
Strength ____ 1,000 pounds per square inch __	81	80	80	80	81	80
Nonlint content ____ percent __	5. 8	5. 4	5. 9	5. 7	5. 6	5. 4
Spinning:						
Picker and card waste ____ do ____	9. 4	8. 9	8. 6	9. 2	9. 7	9. 6
Neps number per 100 square inches of card web __	28	30	26	20	34	31
Average yarn strength ____ index __	88	89	89	88	90	90
Average yarn appearance ____ do ____	85	85	85	85	80	85

LATE-SEASON UNDEFOLIATED MACHINE-PICKED ARIZONA 44 (crops of 1951–52) [10]

Test item	6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	19-cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour ____ pounds __	7. 6	7. 2	7. 6	7. 8	7. 4	7. 3
Turnout ____ percent __	32. 8	32. 6	33. 8	33. 6	32. 6	32. 5
Fiber:						
Lint moisture ____ do ____	4. 6	4. 5	4. 5	4. 6	4. 4	4. 0
Grade [3] ____ designation __	SLM	SLM	SLM	SLM	SLM+	SLM
Staple length ____ 1/32 inch __	34	34	34	34	34	34
Upper half mean length (Fibrograph) inches __	1. 05	1. 06	1. 06	1. 05	1. 06	1. 06
Uniformity ratio ____ index __	75	75	76	75	74	75
Strength ____ 1,000 pounds per square inch __	82	83	82	82	81	81
Nonlint content ____ percent __	6. 4	6. 1	6. 0	6. 4	6. 0	5. 6
Spinning:						
Picker and card waste ____ do ____	12. 1	11. 7	11. 4	12. 1	11. 5	10. 5
Neps number per 100 square inches of card web __	31	37	27	26	29	25
Average yarn strength ____ index __	94	92	92	92	92	93
Average yarn appearance ____ do ____	70	68	70	70	68	68

See footnotes at end of table.

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Table 1.—*Effects of preliminary seed-cotton treatments on the ginning performance, fiber properties, and spinning performance of varieties of Acala cottons* [1]—Continued

MIDSEASON UNDEFOLIATED HAND-PICKED ACALA 4–42 (crops of 1950–51) [11]

Test item	Values obtained by preginning treatments with—					
	6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	19-cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour___pounds__	5. 6	5. 2	5. 2	6. 0	6. 0	5. 4
Turnout___percent__	34. 2	35. 2	34. 8	35. 2	35. 4	35. 0
Fiber:						
Lint moisture___do___	4. 4	4. 3	4. 4	4. 2	4. 2	4. 3
Grade [3]___designation__	M+	SM−	SM	SM−	SM	SM−
Staple length___1/32 inch__	34	34	33	33	34	34
Upper half mean length (Fibrograph) inches__	1. 08	1. 09	1. 08	1. 08	1. 08	1. 09
Uniformity ratio___index__	78	78	78	78	78	78
Strength___1,000 pounds per square inch__	86	85	86	85	85	85
Nonlint content___percent__	4. 8	4. 3	4. 6	4. 6	4. 5	4. 8
Spinning:						
Picker and card waste___do___	8. 3	8. 6	8. 8	9. 0	8. 1	8. 3
Neps number per 100 square inches of card web	10	11	20	15	15	13
Average yarn strength___index_	98	98	99	99	96	97
Average yarn appearance___do___	95	95	95	95	95	90
LATE-SEASON UNDEFOLIATED HAND-PICKED ACALA 4–42 (crops of 1950–51) [12]						
(No ginning data)						
Fiber:						
Lint moisture___percent__	5. 2	5. 7	5. 5	5. 6	5. 5	5. 5
Grade [3]___designation__	LM+	SLM	SLM	SLM−	SLM	SLM+
Staple length___1/32 inch__	36	36	36	36	36	36
Upper half mean length (Fibrograph) inches__	1. 10	1. 10	1. 11	1. 10	1. 11	1. 10
Uniformity ratio___index__	84	81	80	81	80	81
Strength___1,000 pounds per square inch__	78	80	80	80	80	79
Nonlint content___percent__	5. 5	4. 3	4. 9	5. 1	4. 2	3. 9
Spinning:						
Picker and card waste___do___	9. 6	8. 5	9. 0	8. 8	8. 5	8. 3
Neps number per 100 square inches of card web_	21	30	32	26	29	32
Average yarn strength___index__	94	92	93	93	93	93
Average yarn appearance___do___	105	105	95	100	95	100
MIDSEASON UNDEFOLIATED MACHINE-PICKED ACALA 4–42 (crops of 1951–52) [13]						
Ginning:						
Capacity, lint per saw per hour___pounds__	8. 9	8. 7	8. 9	9. 4	9. 0	8. 9
Turnout___percent__	33. 0	33. 0	34. 3	34. 1	32. 7	33. 0
Fiber:						
Lint moisture___do___	5. 6	5. 3	6. 0	6. 2	5. 5	5. 3
Grade [3]___designation__	M−	M	M	M−	M	M
Staple length___1/32 inch__	35	35	35	35	35	34
Upper half mean length (Fibrograph) inches__	1. 08	1. 10	1. 08	1. 09	1. 08	1. 08
Uniformity ratio___index__	78	79	76	78	78	78
Strength___1,000 pounds per square inch__	102	102	103	101	99	105
Nonlint content___percent__	7. 2	6. 4	6. 2	6. 8	6. 7	5. 9
Spinning:						
Picker and card waste___do___	10. 0	9. 6	9. 4	10. 3	9. 3	8. 9
Neps number per 100 square inches of card web__	10	11	11	11	14	13
Average yarn strength___index__	113	115	116	116	117	116
Average yarn appearance___do___	105	105	105	105	105	105

See footnotes at end of table.

TABLE 1.—*Effects of preliminary seed-cotton treatments on the ginning performance, fiber properties, and spinning performance of varieties of Acala cottons* [1]—Continued

LATE-SEASON UNDEFOLIATED MACHINE-PICKED ACALA 4–42 (crops of 1951–52) [14]

Test item	Values obtained by preginning treatments with—					
	6-cylinder cleaner	13-cylinder cleaner	19-cylinder cleaner	6-cylinder cleaner and bur machine	13-cylinder cleaner and bur machine	cylinder cleaner and bur machine
Ginning:						
Capacity, lint per saw per hour____pounds__	8. 2	8. 0	8. 8	8. 4	8. 0	8. 1
Turnout________________________percent__	31. 9	31. 8	32. 7	32. 8	30. 8	31. 7
Fiber:						
Lint moisture_____________________do____	4. 7	4. 7	4. 9	4. 9	4. 6	4. 5
Grade [3]___________________designation__	SLM−	SLM	M−	SLM	SLM+	SLM+
Staple length_________________1/32 inch__	34	34	34	33	34	34
Upper half mean length (Fibrograph) inches__	1. 10	1. 10	1. 10	1. 09	1. 10	1. 08
Uniformity ratio_________________index__	77	76	76	76	77	76
Strength____1,000 pounds per square inch__	92	94	93	92	92	92
Nonlint content_________________percent__	7. 4	6. 5	6. 3	7. 4	6. 4	6. 3
Spinning:						
Picker and card waste______________do____	11. 5	11. 1	10. 5	11. 7	10. 9	10. 4
Neps number per 100 square inches of card web__	15	12	13	12	12	12
Average yarn strength____________index__	102	104	104	103	103	104
Average yarn appearance___________do____	90	88	92	90	92	90

[1] Each type of cotton was tested in 3 replications.
[2] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 2.8 percent; average wagon-sample moisture content, 6.5 percent.
[3] M=Middling; SM=Strict Middling; SLM=Strict Low Middling; LM=Low Middling.
[4] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 3.8 percent; average wagon-sample moisture content, 6.2 percent.
[5] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 1.3 percent; average wagon-sample moisture content, 6.7 percent.
[6] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 4.1 percent; average wagon-sample moisture content, 6.8 percent.
[7] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 2.7 percent; average wagon-sample moisture content, 6.1 percent.
[8] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 3.4 percent; average wagon-sample moisture content, 5.8 percent.
[9] All treatments included tower drier (160° F.) and extractor-feeder. Average wagon-sample foreign-matter content, 6.3 percent; average wagon-sample moisture content, 7.8 percent.
[10] All treatments included tower drier (160° F.) and extractor-feeder. Average wagon-sample foreign-matter content, 9.6 percent; average wagon-sample moisture content, 8.2 percent.
[11] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 2.8 percent; average wagon-sample moisture content, 7.0 percent.
[12] All treatments included tower drier (no heat) and extractor-feeder. Average wagon-sample foreign-matter content, 5.8 percent; average wagon-sample moisture content, 10.6 percent.
[13] All treatments included tower drier (160° F.) and extractor-feeder. Average wagon-sample foreign-matter content, 4.8 percent; average wagon-sample moisture content, 10.5 percent.
[14] All treatments included tower drier (160° F.) and extractor-feeder. Average wagon-sample foreign-matter content, 10.8 percent; average wagon-sample moisture content, 9.5 percent.

Tests on Defoliated and Undefoliated Cottons (Crops of 1953–55)

For 3 years, undefoliated hand-picked, undefoliated machine-picked, and defoliated machine-picked cottons were included in cleaning studies conducted at the Southwestern Cotton Ginning Research Laboratory on New Mexico and Arizona cottons. The objectives of these studies were to determine: (1) The effects on the cottons of defoliation versus nondefoliation; (2) the results of machine picking versus hand picking; and (3) the optimum methods of cleaning and ginning harvested cottons.

Two upland varieties were used in these tests—Acala 1517 grown in New Mexico, and Acala 44 (Arizona 44) grown in Arizona. Both midseason and late-season cottons, representing harvests before and after frost, respectively, were obtained from producers and State experiment stations.

TABLE 2.—*Seed-cotton cleaning and extracting equipment required to obtain maximum grades for four upland varieties of hand-picked and machine-picked cottons—Acala 1517, Mesilla Valley, Arizona 44, and Acala 4-42—tests of 1950–52*

Seasons of harvest	Methods of harvest	Cleaning and extracting equipment required to obtain maximum grades [1]	Wagon-sample foreign-matter content ranges	Wagon-sample moisture content ranges	Maximum grades obtained [2]	Grade increase ranges
			Percent	*Percent*	*Designation*	
Midseason	Hand picking	13 cylinders	1. 3–2. 8	6. 1– 7. 0	SM	0–⅔
Late season	Hand picking	19 cylinders; or 13 cylinders and bur machine.	3. 4–5. 8	5. 8–10. 6	M	⅔–1
Midseason	Machine picking	13 cylinders	4. 8–6. 3	7. 8–10. 5	M	⅓–⅔
Late season	Machine picking	19 cylinders; or 13 cylinders and bur machine.	9. 6–10. 8	8. 2– 9. 5	SLM+	⅓–1

[1] All treatments included tower drier (no heat for hand-picked, 160° F. for machine-picked cottons) and extractor-feeder.

[2] SM=Strict Middling; M=Middling; SLM=Strict Low Middling.

The methods of harvest for both of these varieties were: Hand picking and machine picking for the midseason undefoliated cottons, and machine picking only for the midseason defoliated cottons; hand picking and machine picking for the late-season undefoliated cottons, and machine picking only for the late-season defoliated cottons.

All the cottons used in these tests had been irrigated and cultivated by current production practices, and all were uniform in appearance. Commercial defoliants were applied by ground equipment, helicopter, and airplane. Two makes of spindle-type harvesters with different spindle-moistening methods were employed.

Four seed-cotton cleaning combinations with saw-type lint cleaning were tested with these cottons at the laboratory. During ginning, lint samples for classification and for fiber and spinning analyses were drawn prior to and following treatment by the lint cleaner. The four combinations used were:

1. (Control). Tower drier, 6-cylinder cleaner, extractor-feeder, saw gin, and saw-type lint cleaner.
2. Tower drier, 13-cylinder cleaner, extractor feeder, saw gin, and saw-type lint cleaner.
3. Tower drier, 13-cylinder cleaner, bur machine, extractor-feeder, saw gin, and saw-type lint cleaner.
4. Tower drier, 19-cylinder cleaner, bur machine, extractor-feeder, saw gin, and saw-type lint cleaner.

The cottons in some series of tests received no artificial heat in the drier whereas the cottons in other series received 160° F. Within each series of tests, all lots were treated alike in the drier.

Machine-picked cottons, both undefoliated and defoliated, were found to contain more trash than did the undefoliated hand-picked cotton (fig. 5). The undefoliated machine-picked cottons, as compared with cottons picked by the other two methods of harvest, usually had the highest percentages of foreign matter and moisture in the wagon samples. They also had the highest cottonseed moisture content; this probably accounted for their having the lowest percentage by weight of lint turnout, because the seeds were heavier in comparison with the lint. Furthermore, these undefoliated machine-picked cottons were less fluffy than were the other cottons and they ginned slightly faster.

The ginned lint from the machine-picked defoliated cottons had slightly more neps than did the lint from the undefoliated cottons. These differences were so slight, however, that nep formation was not considered when evaluating the effects on cotton quality of defoliating or machine picking.

Staple lengths were not affected by methods of harvest, methods of ginning, or lint cleaning. Differences in length were attributable, rather, to varieties of cotton and seasons of harvest. The fibers of cottons harvested in early season were usually from 1/32 to 1/16 inch longer than were those of cottons harvested in late season.

Various fiber-laboratory and spinning-laboratory measurements on these cottons indicated that the harvesting and ginning methods reported herein did not, in general, significantly damage the qualities of the cottons. In this series of tests, classers' grades were used to determine the effects on cotton of the various treatments, inasmuch as staple

BN-7216X

FIGURE 5.—Cottons representing three methods of harvest (crops of 1953–55).

length and other fiber qualities were not impaired or otherwise affected. The average grades of all cottons were improved over those of the control lots by increasing the number of cleaning cylinders or by using the saw-type lint cleaner (fig. 6). The lint-cleaning results of these tests were in general agreement with the test results obtained with the USDA-designed lint cleaner.[2]

BN-7213X

FIGURE 6.—Battery of saw-type lint cleaners in a commercial gin.

The ginning equipment, with and without saw-type lint cleaners, required to obtain the highest possible cotton grades are shown in table 3. Also shown are the foreign-matter contents of these cottons as they arrived at the laboratory and the grade improvements for each type of cotton. The foreign-matter ranges indicate considerable variation in quantity of the trash in cottons even when harvested by the same method. Methods of harvest, foreign-matter content, and moisture content should be taken into consideration when using this table as a guide in selecting the best ginning methods. For example, some of the cleanest cottons, hand picked before frost, were ginned efficiently with only the control setup, which was minimum equipment. Generally, however, the other cleaning setups were found to be more efficient.

The undefoliated cottons that were machine picked before frost while the leaves were green required slightly more cleaning than did the de-

[2] STEDRONSKY, V. L., and SHAW, C. S. THE FLOW-THROUGH LINT-COTTON CLEANER. U. S. Dept. Agr. Cir. 858, 30 pp., illus. 1950.

Table 3.—*Ginning equipment,[1] without and with saw-type lint cleaners, required to obtain maximum grades for two upland varieties of hand-picked and machine-picked cottons—Acala 1517C and Arizona 44—crops of 1953–55*

Methods of harvest	Cleaning and extracting equipment required to obtain maximum grades		Wagon-sample foreign-matter content		Grades obtained [2]		
	Without lint cleaner	With lint cleaner	Average	Range	Control (6-cylinder range)	Maximum	Difference
Before frost (crops of 1953–55):							
Undefoliated cottons:			*Percent*	*Percent*	*Designation*	*Designation*	
Hand picking	13 cylinders	6 cylinders	4. 0	1. 6–11. 3	SM−	SM	⅓ grade.
Machine picking	19 cylinders and bur machine.	13 cylinders and bur machine.	4. 8	2. 9– 5. 6	M−	M+	⅔ grade.
Defoliated:							
Machine picking	13 cylinders and bur machine.	13 cylinders and bur machine.	4. 0	2. 8– 5. 2	M−	M+	⅔ grade.
After frost (crops of 1954–55):							
Undefoliated cottons:							
Hand picking	13 cylinders	6 cylinders	3. 8	3. 3–11. 3	M	M+	⅓ grade.
Machine picking	19 cylinders and bur machine.	13 cylinders and bur machine.	9. 6	2. 9–23. 9	SLM	M−	⅔ grade.
Defoliated cottons:							
Machine picking	19 cylinders and bur machine.	13 cylinders and bur machine.	9. 6	3. 1–24. 0	SLM	SLM+	⅓ grade.

[1] All ginning setups included tower drier, extractor-feeder, and 80-saw gin.
[2] SM=Strict Middling; M=Middling; SLM=Strict Low Middling.

foliated machine-picked cottons, but they attained the same grades. The undefoliated cottons that were machine picked after frost attained higher maximum grades than did the defoliated machine-picked cottons. The hand-picked cottons were consistently higher in grade—from two-thirds to one full grade above the machine-picked cottons.

The saw-type lint cleaner usually increased bale values of the late-season-harvested Acala cottons that were in grade ranges below Middling. The tests proved that grades above Middling may be slightly improved by using the lint cleaner; however, the necessary losses in weight frequently offset the advantage of grade improvement when bale values are considered.

The growing seasons during these tests were shortened by fairly early frosts, which lessened the expected benefits of defoliation. This effect of early frosts has also been reported by many producers who have been disappointed in results obtained with defoliants. The normally short growing season in New Mexico has caused producers in that State to refrain from the practice of defoliation. In Arizona, however, the longer growing season has tended to make defoliation a frequent practice in order to obtain higher grades.

Stick-Remover Tests

Cleaners were compared for effectiveness in removing different components of trash. This was done by using 4 types of cleaners and extractors on 2 growths of Acala 1517 cottons from the 1955 crop. Average ranks of machines in foreign-matter removal were as follows:

For sticks and stems:
1. Stick remover
2. Bur machine
3. Extractor-feeder
4. 6-cylinder cleaner

For hulls:
1. Bur machine
2. Extractor-feeder
3. Stick remover
4. 6-cylinder cleaner

For fine trash:
1. 6-cylinder cleaner
2. Extractor-feeder
3. Stick remover
4. Bur machine

For total trash:
1. Extractor-feeder
2. Stick remover
3. Bur machine
4. 6-cylinder cleaner

As these cottons were not excessively heavy with sticks and stems, the main purpose of the tests was to determine the effects of the stick remover on cotton quality. From the standpoint of classification, including color, leaf content, and preparation, the cottons subjected to the stick remover were equal in quality to those cleaned by other machinery. Fiber length, as determined by both the classer and the Fibrograph, was not shortened by the stick remover. Other measurements of fiber quality, including tensile strength and uniformity of length, showed no ill effects from the stick remover. Spinning-test results, including manufacturing waste, yarn strength, and yarn appearance, revealed that the stick remover was an effective cleaner and caused no apparent damage to the quality of the cotton.

The stick remover was also included in the cleaning studies of defoliated versus undefoliated and of machine-picked versus hand-picked cottons in 1955. The methods of harvest were hand picking without defoliation, machine picking without defoliation, and machine picking with defoliation. The efficiency of the stick remover compared favorably with that of the bur machine and other cleaners in removing trash from the seed cottons and consequently in obtaining maximum grades. These cottons were from the first picking, before frost only; and they graded high even with no cleaning—especially the hand-picked cottons. However, the machine-picked cottons, both defoliated and undefoliated, did improve in grade with all cleaning treatments.

The stick remover had no adverse effects on staple length, fiber, and spinning properties, but these cottons of the 1955 crop were not trashy enough to require elaborate cleaning treatment in order to maintain satisfactory grades. Unfortunately, there was not enough cotton left in the field for a late harvest that would have been more suitable for the stick-remover tests.

The stick remover was further tested on the 1956 crop of a new variety, Acala (Arizona) WR44 (wilt resistant), produced in Arizona. Early-season hand-picked cotton harvested before frost and late-season machine-picked cotton harvested after frost were both transported to the laboratory for testing. The cottons from both harvests, when cleaned with the stick remover, were among the highest in grade for six cleaning treatments. There were no differences in staple lengths or other fiber properties, and the spinning-test results compared very favorably.

The USDA-developed stick remover was invented at the United States Cotton Ginning Research Laboratory, Stoneville, Miss., and has been tested at both the Stoneville and the Mesilla Park laboratories (fig. 7).[3] Tests have provided evidence that the machine not only is effective in removing sticks and stems from cotton; it also does an excellent job of removing other types of foreign material, such as hulls, motes, leaf particles, and fine trash.

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FIGURE 7.—USDA–developed stick remover.

The stick remover uses the centrifugal principle of extraction. The successive saw cylinders are arranged in a vertical position, one under the other, and suitable brushes are provided to doff the cleaned seed cotton from each of three successive cleaning saws. A reclaiming saw, following the last cleaning cylinder, reclaims any seed cotton that may have been thrown in with the foreign matter by the cleaning saw cylinder.

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[3] FRANKS, G. N., and SHAW, C. S. STICK REMOVER FOR COTTON GINS. U. S. Dept. Agr. Prod. Res. Rpt. 22, 39 pp., illus. 1959.

Drying Seed Cotton

Seed-cotton drying tests were conducted at the Southwestern Cotton Ginning Research Laboratory, Mesilla Park, N. Mex., on locally grown cottons, 1949–50. The USDA-designed tower drier was used in these tests (fig. 8).[4]

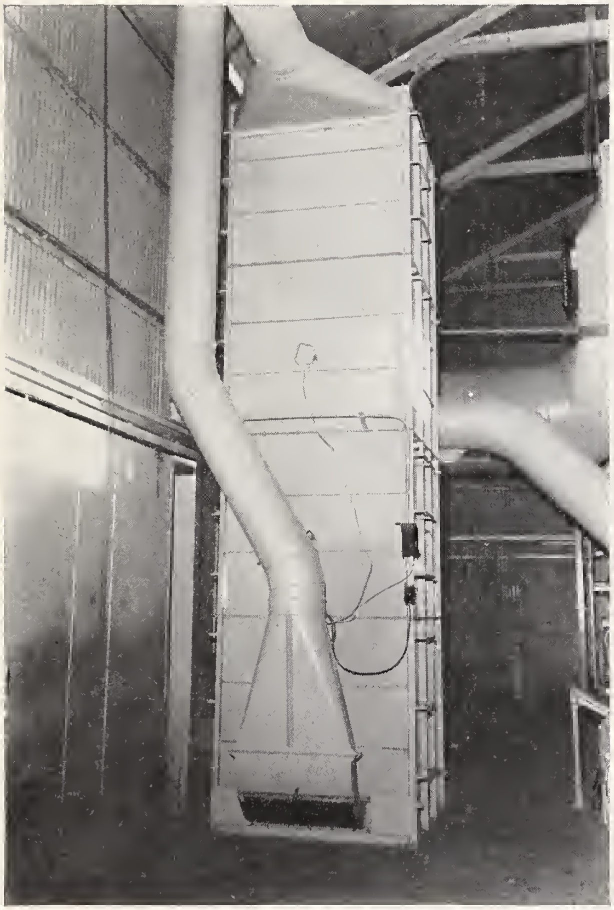

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FIGURE 8.—USDA-designed tower drier in a commercial gin.

In the 1949 tests, only late-season hand-picked Acala 1517 cotton was used; in 1950, however, both early- and late-season hand-picked cottons of two varieties (Mesilla Valley and Acala 1517) were included. The purpose of these studies was to determine the effects of drying on fiber and spinning qualities of southwestern upland cotton.

The staple lengths of these two varieties of early-harvested cottons were quite different. Those of Mesilla Valley cotton were 1¼ inches long; those of Acala 1517 were 1$\frac{5}{32}$ inches. The staple lengths of both varieties from the late-season harvest were shorter—1⅛ inches for Mesilla Valley and 1$\frac{3}{32}$ inches for Acala 1517. For both varieties, the fibers from late-harvested cotton as compared with those from early-harvested cotton were immature and low in Micronaire readings, or very fine; consequently, they were susceptible to nepping.

The moisture contents of the seed cottons received at the gin ranged from a very dry 4.8 percent for the late-season Mesilla Valley cotton to a slightly damp 12.8 percent for the early-season Mesilla Valley; the lint moisture contents were 3.0 percent and 5.2 percent, respectively. Similar samples of seed cotton for the 1517 variety ranged in moisture content from 5.2 percent for late-season to 10.9 percent for early-season; the respective lint moisture contents were 3.9 percent and 5.0 percent.

The moisture contents of these varieties are usually low compared with those of rain-grown cottons in other areas, but they are typical of the Southwest.

The cleaning equipment was constant for all lots of cotton used in these drying tests. It consisted of tower drier, 4-cylinder cleaner, 7-cylinder cleaner, extractor-feeder, 80-saw gin, and saw-type lint cleaner. The variables for the respective test lots were the drying temperatures in the tower drier. These were: No heat, for the control lot; 150° F.; 200° F.; 250° F.; 150° F., applied twice; and 150° F., applied 3 times (1949 only).

In spite of previously mentioned variations in fiber properties and moisture contents, the effects of the drying temperatures were similar for most of the cottons used in these tests.

All grades obtained were Middling and above, ranging up to Good Middling for early-season Mesilla Valley, for most of the cottons were already very clean when they arrived at the laboratory. Only on the early-season cottons of both varieties, which were slightly damp, did the drying improve the grades, and then only from one-third to two-thirds of a grade. The moderate temperature of 150° F. (applied once) was sufficient to obtain maximum grades. Additional drying temperatures tended to shorten the staples of all these cottons; this, of course, resulted in lower price per pound.

The results of the tests showed that higher temperatures further reduce bale weight because of greater loss of moisture. Loss in price per pound

[4] BENNETT, C. A., and GERDES, F. L. THE VERTICAL DRIER FOR SEED COTTON. U. S. Dept. Agr. Misc. Pub. 239, rev., 31 pp., illus. 1941.

plus loss in bale weight sometimes costs the grower several dollars per bale. Therefore dry, clean cotton that will normally grade above Middling should not be subjected to excessive drying.

The drier is necessary conditioning equipment in the modern gin. Heat, however, should be applied only to damp or wet cotton, including early "green" cotton, spindle-harvested cotton (when moisture is applied to the spindles), dew-laden cotton, and cotton that has been exposed to an infrequent southwestern shower.

Ginning Capacity

Numerous characteristics of cotton fiber and cottonseed as well as environmental conditions seem to affect ginning capacity. The greatest contributing factors are seed-roll density, fiber moisture content, and speed of saws. Other factors that may affect capacity to some extent are size of seed, amount of linters or fuzz fibers on cottonseed, and tenacity of fibers at points of attachment to the seed.

In the laboratory tests, ginning capacity, or volume of ginning, was measured and calculated in pounds of lint ginned per saw per hour. These tests indicated that higher capacities usually occur with midseason as compared with late-season cottons; with damp as compared with dry and fluffy cottons; with machine-picked as compared with hand-picked cottons; and with undefoliated machine-picked as compared with defoliated machine-picked cottons.

Among the various cottons subjected to the 6 seed-cotton cleaning treatments, as shown in figure 4, the maximum ginning capacity with all treatments was obtained with machine-harvested midseason Acala 4–42, with 9.0 pounds of lint per saw per hour. For all cottons, the highest average capacity was 7.0 pounds of lint per saw per hour; the setup that obtained this capacity had 6 cylinders of cleaning plus the bur machine. The average capacity for all cottons and all treatments was 6.7 pounds of lint per saw per hour. The differences were considerably greater among the cottons than among the cleaning treatments.

In the lint-cleaning and rate-of-feed studies (1951–52), 4 Acala cottons—harvested in early season, midseason, and late season—were tested in three replications to determine the effects on cotton quality of various seed-roll densities with and without saw-type lint cleaners. The cottons were fed to the gin stands at varying rates to produce loose, medium, and tight seed-roll densities. The loose rolls ginned from about 5.0 to 7.5 pounds of lint per saw per hour; the medium rolls, from about 7.5 to 9.5 pounds; and the tight rolls, from about 9.5 to 12.0 pounds. Lint samples drawn from these seed-roll conditions, with and without the lint cleaner, were analyzed for fiber properties, classification, and spinning performance.

Increasing the ginning capacity by increasing the rate of feed to cause a tight seed roll usually resulted in slight grade reduction and in increased manufacturing waste, lint-cleaner waste, and cottonseed-linters content. Staple length and other fiber properties were not affected by seed-roll densities or ginning capacities; but reductions in grade and turnout, resulting from tight seed rolls, caused slight reductions in total bale values. The tight rolls caused greater reductions in bale values of late-season harvests than in those of early and midseason harvests.

Neps in Ginned Lint

Neps are small knots of tangled cotton fibers (fig. 9). In the manufacture of yarn and cloth, occurrence of an abundance of neps is considered a serious handicap to quality. Whether or not the yarn or cloth is dyed, neps are visible and detract from the appearance and salability of the woven fabric.

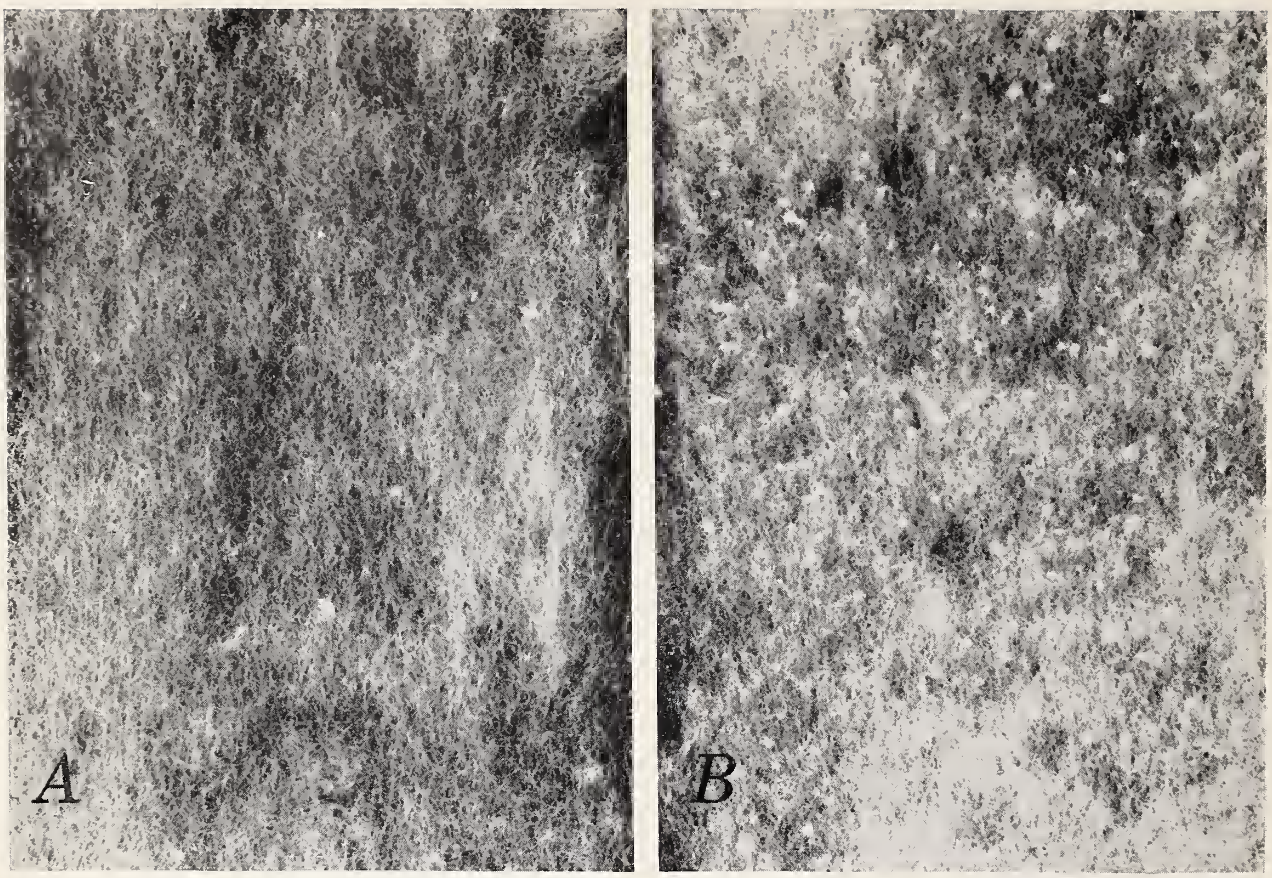
Pearson [5] states that neps are "dependent upon manipulation, and consequently they are not found in unpicked cotton." That is, they are formed during harvesting and handling by the producer, during the broad processes of ginning, and during various stages of spinning by the manufacturer. All these steps involve manipulation, or handling, of the cotton.

Inasmuch as nepping is attributable in large part to ginning processes, the Southwestern Cotton Ginning Research Laboratory is investigating the sources and causes of neps in cotton fibers.

The Nepotometer (fig. 10) is an instrument used to prepare samples of ginned lint for nep counts.

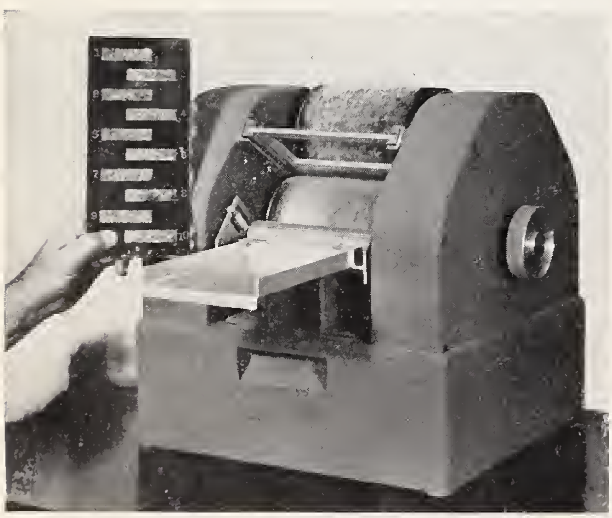
Numerous tests and observations have been conducted by the Southwestern Cotton Ginning Research Laboratory to determine the relationship between susceptibility to nepping and other fiber properties. Although unmanipulated cotton

[5] Pearson, N. L. NEPS IN COTTON YARNS AS RELATED TO VARIETY, LOCATION, AND SEASON OF GROWTH. U. S. Dept. Agr. Tech. Bul. 878, 18 pp., illus. 1944.



BN-7218X

FIGURE 9.—Neps in cotton lint: *A*, Slightly neppy; *B*, very neppy.



BN-7211X

FIGURE 10.—The Nepotometer.

in the boll contains no neps, the nepping potential of the fibers seems to be determined largely by heritable characteristics and by conditions and environment of the cotton before harvest. Fiber characteristics, such as length, fineness, strength, and especially maturity, affect the formation of neps.

The effects on the formation of neps of certain field conditions, fiber qualities, and harvesting and ginning methods are explained in the following paragraphs.

Varietal characteristics.—Great differences have been found in the neppiness of cotton fibers of different varieties. In 1951, ginning tests conducted on 5 varieties at the laboratory showed nep counts ranging from 10 to 50 neps per square inch of card web when all these varieties were ginned alike.

Time of harvest.—In 1953–54, early- and mid-season-harvested cottons produced more mature fibers and fewer neps than did late-season cottons.

Defoliation of plants before harvest.—Such defoliation is usually associated with slightly more neps than are found in undefoliated cottons. Defoliation shortens the growing season, arrests or retards the maturing of the fibers, and tends to slightly increase the nep potential. The differences in neppiness of defoliated and undefoliated cottons are greater in late-season than in midseason-harvested cottons.

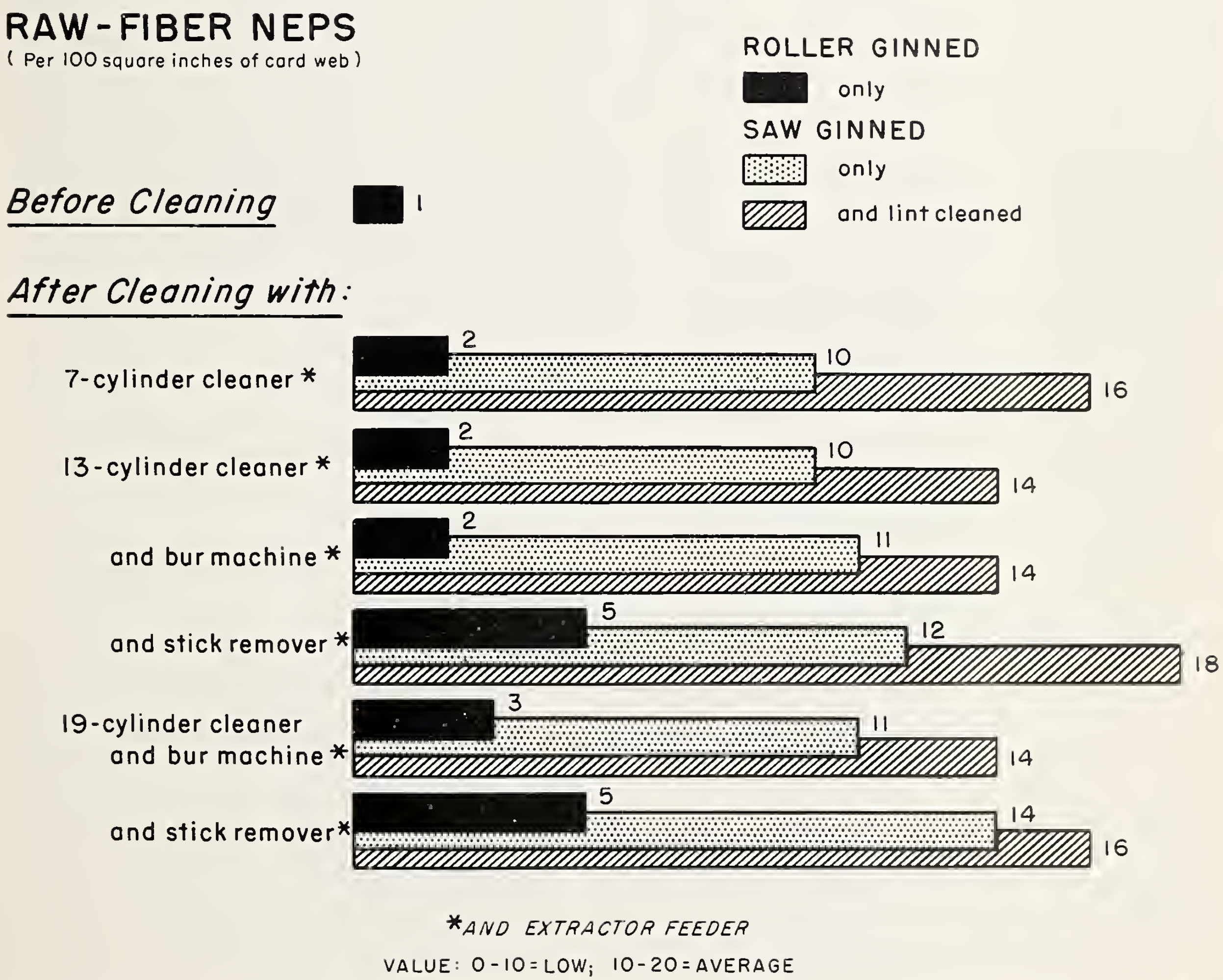
Machine harvesting.—Mechanical harvesting with spindles, as compared with hand picking, usually does not significantly increase the neps in fiber. However, in late-season low-grade immature cottons, significant increases have been found in the neppiness of mechanically harvested cotton.

Fineness of fiber.—This quality, which is determined by the Micronaire, is associated with susceptibility of lint to nepping because fine fibers become tangled more readily than do coarse fibers.

Degree of maturity.—Maturity seems to be the most important factor in relation to neppiness. This is because, within a variety, immature cotton fibers are usually finer than mature fibers. Immature fine fibers are more susceptible to nepping than are mature fibers, regardless of variations in normal conventional ginning practices. Very immature fibers as found in late-season bollies—especially after an early frost—produce more neps than are found in a typical early-season crop.

Drying of cotton in the gin.—Drying treatments and resultant changes in moisture contents of fiber, based on a 2-year study, showed no consistent nep-forming trends. Studies conducted on late-harvested cottons showed only a slight increase in neps; this was occasioned by application of high drying temperatures as compared with no heat.

Moisture restoration.—During tests of 1951–52, moisture was restored to dry cotton by increasing the relative humidity in a storage room to as much as 90 percent, and keeping the cotton in this condition before ginning for various lengths of time



BN-7208

Figure 11.—Nep content of lint as affected by seed-cotton cleaning and extracting equipment with roller ginning, with saw ginning, and with saw ginning plus saw lint cleaning.

until its lint-moisture content increased from approximately 5.0 to 9.0 percent. This moisture increase did not affect the nepping of the cotton.

Cleaning and extracting.—Formerly, it was generally believed that during the cleaning and extracting stages of seed cotton in the gin, excessive neps were formed in the fiber. This opinion has been found erroneous as far as Acala cotton under test conditions is concerned. During four crop seasons, several varieties of hand-picked and machine-picked upland cottons—harvested in midseason and late season—were used in ginning tests to determine the causes of nep formation in ginned lint. Numerous seed-cotton cleaning and extracting setups were used; these provided increasing amounts of treatment. All test results were in agreement in showing that nep formation was not increased significantly by the seed-cotton cleaning and extracting equipment used (fig. 11).

Rate of feeding cotton to the gin stand.—Rate of feed was regulated to produce loose, medium, and tight seed rolls. In tests with four Acala varieties harvested in midseason and late season, the varying seed-roll densities did not affect the formation of neps.

Roller ginning versus saw ginning.—In these tests nep counts in roller-ginned upland cottons usually ranged from 0 to about 5 and were extremely low, regardless of preceding treatments in the gin. Nep counts in saw-ginned cottons were consistently higher than in roller-ginned cottons. Variations in nep count, however, seem to be largely influenced by fiber fineness, percentage of immature fibers, and other fiber properties characteristic of varieties; or they may be determined by environmental conditions that affect growth of the fibers.

Fiber-Quality Research

The fiber research clinic (fig. 12) provides the staff of the Southwestern Cotton Ginning Research Laboratory with immediate information on current tests. These data cover the effects

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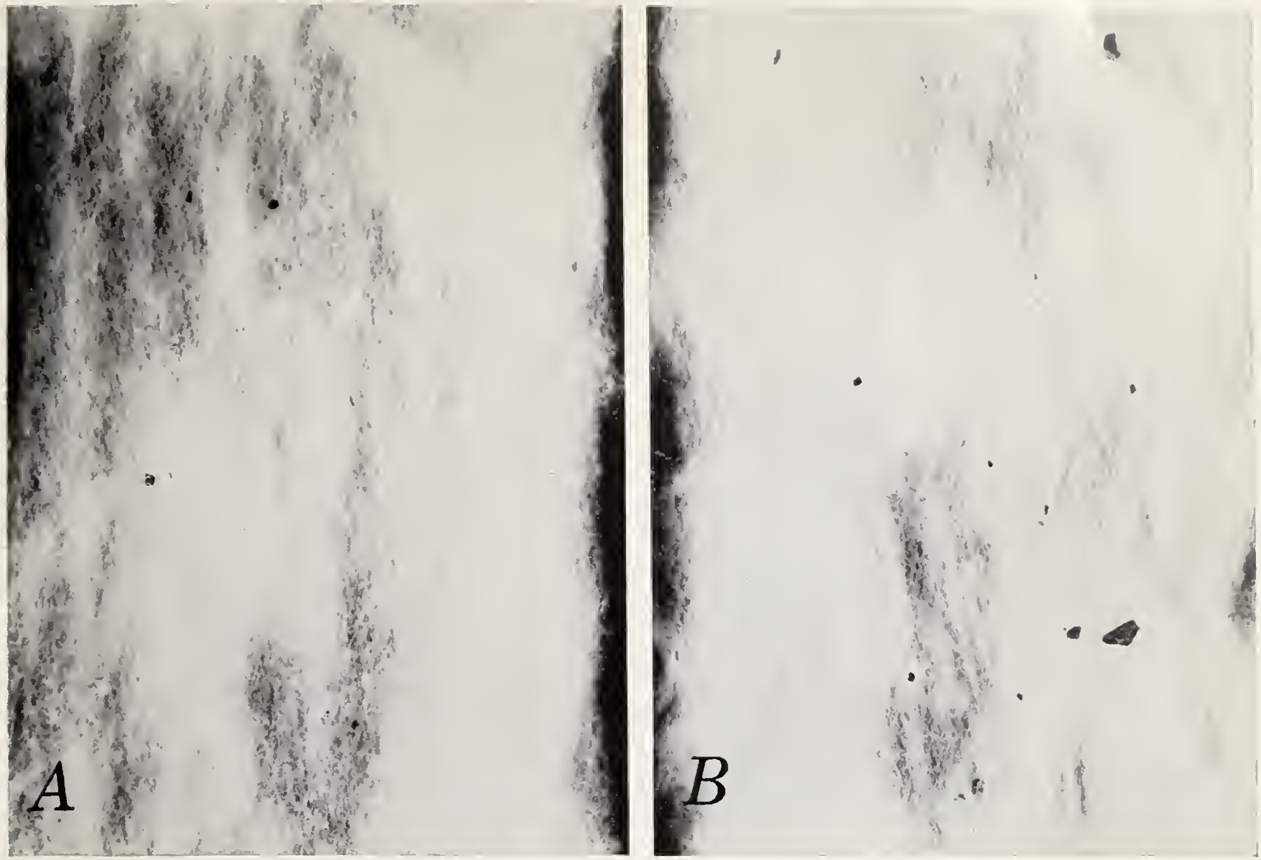
Figure 12.—General view of fiber research clinic at the Southwestern Cotton Ginning Research Laboratory, Mesilla Park, N. Mex.



BN-7214X

FIGURE 13.—Seedcoat fragments in cotton lint: *A*, Light; *B*, heavy.

on cotton quality of ginning equipment, methods, practices, and operations associated with ginning; and they afford a basis for adjusting the research programs to suit the requirements of the cotton varieties ginned under various environmental conditions. The object of this research is improved controls for ginning cottons in the Southwest.

Studies conducted at this clinic have resulted in the development of an accurate test of seedcoat fragments (chipped seeds) in ginned lint. The amount of such fragments in the lint constitutes an important qualitative factor, as their presence reduces the grade and value of the cotton (fig. 13). The newly developed test is being used to evaluate the effects of experimental ginning machinery and methods on seedcoat fragments in lint.

The Shirley Analyzer (fig. 14) is a commercial fiber-testing device that indicates the percentage of foreign matter in ginned lint. It is used to determine total percentages of foreign matter, including leaves, motes, seedcoat fragments, and grass. Its use is necessary in evaluating the efficiency of cleaning and extracting machinery used on seed cotton and lint and of various other treatments applied at the Southwestern Cotton Ginning Research Laboratory.

The Nepotometer is used to prepare samples of ginned lint for nep counts (see fig. 10).

Summary and Conclusions

Results of tests conducted at the United States Southwestern Cotton Ginning Research Laboratory, Mesilla Park, N. Mex., 1949–57, showed that:

Defoliation practices associated with ginning tests had little effect on gin machinery requirements and cotton qualities. These practices, however, may be beneficial to producers because they tend to reduce plant and soil moisture content and boll rot and to permit earlier harvests.

With comparable ginning setups, hand-picked cottons graded from two-thirds to one full grade higher than machine-picked cottons.

In general, staple length and other fiber properties were not significantly affected by the har-

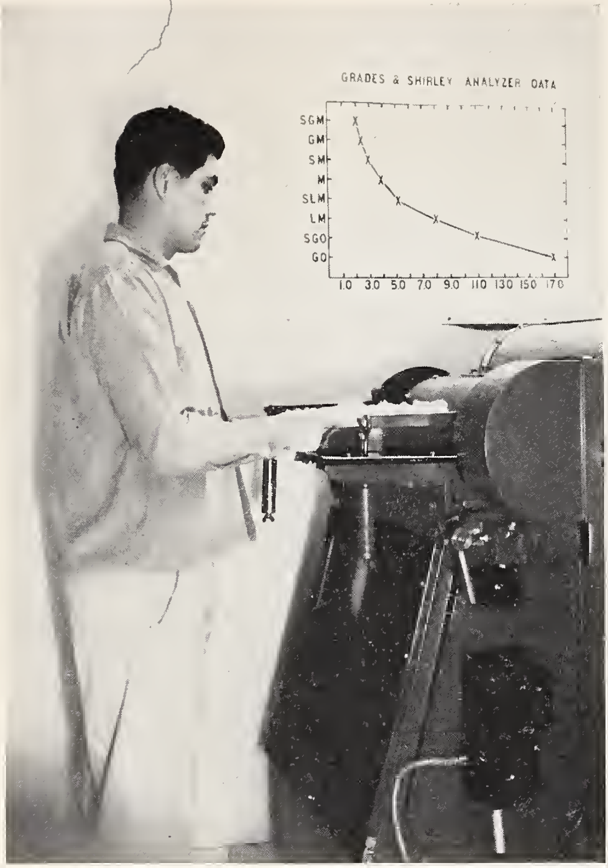


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FIGURE 14.—The Shirley Analyzer.

vesting or ginning methods reported in this publication.

Classers' grades, on a dollar-value-per-bale basis, were used as the criterion for comparing results of cleaning cotton by different methods.

The USDA-developed stick remover ranked first among several cleaning and extracting machines in the removal of sticks and stems. It also ranked high in the removal of other foreign matter from seed cotton without adverse effects on the fiber.

The capacity of a gin, in terms of material handled per hour, is affected by operating elements within the ginning system as well as by fiber moisture content, fiber and cottonseed characteristics, and methods of harvest.

Heat should not be applied within the drier except on damp or wet cotton.

Neps are formed only slightly in each cleaning or extracting machine or by the lint cleaner. When the machinery is arranged in tandem, cumulative nepping effects are noted. The most pronounced nepping occurs in the gin stand. Length, immaturity, and fineness of fibers are important factors in nep formation.

Fiber research is in progress to provide new tests of fiber qualities that can be affected by ginning and related production practices.

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